

DEC STD 140-2 Documentation Requirements for 54-Class Modules and Backplanes

DOCUMENT IDENTIFIER: A-DS-EL00140-02-0000 Rev E, 27-Sep-1991

ABSTRACT: This section of DEC STD 140 defines the minimum documentation structure and the contents of the Drawing Directory (DD) and the Unit Assembly (UA) documentation packages required for the release of 54-class modules and backplanes, including option-level modules such as M-series. DEC STD 140-0 Documentation, Data, and Release Requirements for Printed-Wiring Boards, Modules, and Backplanes— Introduction provides an introduction and general requirements for this standard.

APPLICABILITY: The documentation requirements defined in this standard are mandatory for all 50-class boards, 54-class modules, and 70-class/option backplanes released by Digital.

STATUS: APPROVED 27-Sep-1991; use VTX SMC for current status.

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1 INTRODUCTION

This section of DEC STD 140 defines the documentation structure and the content of the Drawing Directory (DD) and the documentation packages required for the release of 54-class and option-level modules and backplanes.

2 MODULE (54-CLASS) DRAWING DIRECTORY REQUIREMENTS

Drawing Directories (DD) are the controlling documents for modules and backplanes. They serve as an index and a revision management document for the module documentation package. The structure and contents of the module document package are summarized in Table 1. All documents listed in Table 1 shall be included on 54-class DD if present in the 54-class print set.

Table 1: 54-Class Module/Backplane Documentation Base

Drawing Type	Example Drawing Number Format
Drawing Directory for 54-class modules/backplanes	K-DD-54XXXXX-0-0
Unit Assembly Drawing (UA)	K-UA-54XXXXX-0-0
Component overlay(sides 1 and 2)	Sheet 1 (and as required)
Etch rework and wire add sheets (side 1 and side 2) or Etch sheets(as required, all positive etch layers)	
Layers from side 1 to center of board shown from side 1	Sheets as required per ECO
Layers from side 2 to center of board shown from side 2	Sheets as required per ECO
Rework instruction sheet (as required)	Last sheet or on existing sheets if space permits
Outline Drawing (OD) (as required)	K-OD-54XXXXX-0-0
Parts List (PL)	K-PL-54XXXXX-0-DBP
Circuit Schematics (CS)	K-CS-54XXXXX-0-XXXX
PC design data	K-PC-54XXXXX-0-DB
or	or
PC index	K-IF-XXXXXXXX-0-DB
Drawing Directory	K-DD-50XXXXX-0-0

NOTE

There is no longer a separate etch cut drawing. This information is now provided as part of the UA. Refer to Section 3.2.8.2.

The part revision system is defined in *DEC STD 012-0 Part Identification Standard*. Document numbers and corresponding document revision levels are defined in *DEC STD 012-1 Documentation Identification Conventions Including Mnemonic Codes* (Revision N or later). *DEC STD 024-1 Top Document Requirements - DRB 126C Format* provides a description of the specific content requirements for DDs.

3 UNIT ASSEMBLY DRAWING — DRAWING FORMAT AND CONTENT REQUIREMENTS (54-CLASS)

The following sections discuss the drawing format requirements and the content requirements of the Unit Assembly (UA).

3.1 GENERAL 54-CLASS DRAWING FORMAT REQUIREMENTS

For basic drawing format requirements, refer to *DEC STD 013-1 Standard Engineering Drawing Formats and Forms - General Purpose Drawing Sizes and Formats* and EL-EN400-00-0 through EL-EN416-00-0 in EL-ENPCB-00 *PC Board Engineering Handbook — Special Feature Drawings*. Drawings must use a drawing size in accordance with *DEC STD 185-0 Documentation of Computer Media in the Engineering Documentation System*.

Refer to *DEC STD 140-1 Documentation Requirements for Printed-Wiring Boards (50-Class)* for information about metric and U.S. customary systems of dimensioning.

3.1.1 Title/Approval Block

All approval blocks must be complete. Figures 1 and 2 show sheet 1 and the continuation sheet of the Title/Approval block.

The Title/Approval block shall contain the names of the following responsible individuals and the date of approval.

- **DRAWN** — Name of responsible PC layout designer.
- **CHECKED** — Name of responsible PC layout checker.
- **MECH ENG** — Name of engineer responsible for the mechanical integrity of the product.
- **PROJ ENG** — Name of design engineer responsible for the product design.
- **MFG ENG** — Name of the stage 1 prime plant manufacturing representative. Approval occurs at the time of release acceptance.

The following information is also required in the Title/Approval block. The continuation sheet shall contain identical information as required. See Figures 1 and 2.

- **SCALE** — Enter the scale at which the board image was created.
- **SHEET ____ OF ____** — Enter the sheet number and total number of sheets used.
- **TOP DOC NO** — Enter the top document for the module. The top document for modules is usually the DD. Refer to DEC STD 024-1 for top document requirements.
- **TITLE** — Enter the product's functional name. Refer to *DEC STD 030-4 Module Manufacturing Standard - Printed-Wiring Board Design Requirements*, Rule 4170 for further information.
- **SIZE** — Enter the drawing size.
- **CODE** — Enter UA for the 54-level unit assembly (three locations on drawing format).
- **NUMBER** — Enter the assigned 54-level part number (three locations on drawing format).
- **REV** — Enter the current document revision (three locations on drawing format). See Section 7.2.

- **ETCH REV** — Enter the current etch revision. Refer to DEC STD 140-1, subhead 4.1.
- **MEDIA** — Enter *K* for electronic media, or enter the drawing size to be plotted (3 locations on drawing format). Refer to DEC STD 185-0.

Figure 1: Title/Approval Block, Sheet 1

APPROVALS	DATE
DRAWN:	
CHECKED:	
MECH ENG:	
PROJ ENG:	
MFG ENG:	
SCALE:	
SHEET 1 OF	
TOP DOC NO:	

digital ™			
TITLE:			
SIZE	CODE	NUMBER	REV
ETCH REV:			MEDIA

Figure 2: Title/Approval Block, Continuation Sheet

	DOCUMENT NUMBER			
TITLE	SIZE	CODE	NUMBER	REV
	SCALE		SHEET	OF

3.1.2 Copyright Block

REFER TO *DEC STD 128-0 Security Classifications for Engineering Intellectual Property - Policy and Regulations* for the contents of the Copyright block.

3.1.3 Revision Block

The revision block, shown in Figure 3, shall contain the following information in the appropriate column and shall not be completed at initial release.

- **DATE** — Date the ECO is signed-off.
- **RESPONSIBLE ENGINEER** — First initial and last name of the responsible engineer.
- **ECO NUMBER** — Refer to EL-EN100-1A, *Engineering ECO Coordination Procedure*.
- **REV** — The document revision after ECO sign-off.

Figure 3: Sample Revision Block

DATE	RESPONSIBLE ENGINEER	ECO NUMBER	REV

When the documentation is redrawn, as in the case of a re-layout, the title approval block shall be completed with new names and dates, as described in Section 3.1.1.

3.1.4 Design Information Block

To complete the Design Information block shown in Figure 4, indicate which side(s) contain surface mount footprints by entering the minimum pitch of the SMT pads. If none, enter *NONE* for that side.

Figure 4: Design Information Block

DESIGN INFORMATION
SURFACE MOUNT TECH/MINIMUM PITCH: SIDE 1 _____ SIDE 2 _____

3.2 UNIT ASSEMBLY DRAWING CONTENT REQUIREMENTS

The Unit Assembly (UA) drawing defines in detail all component locations on a module or backplane and any special assembly instructions. It also shows all hole locations and part reference designators. For connectors on backplanes, a minimum of pins 1 and 2 and the last two pins shall be shown. For examples, refer to ELEN140-00, *Design Drawing Examples*.

If the hole location symbols or component outlines interfere with reading the reference designator, a second sheet of the UA should be supplied showing reference designators only. The circuit outline shall be shown with dimensions marked as *REF*.

Any applicable engineering documents, specifications, and/or special requirements shall be listed as a note. The preferred notes area is the upper-right corner. Information specified on the UA supersedes all standards and referenced documents.

3.2.1 Scale

The board image shown on the UA shall be 2:1. Specify the scale at which the board image was created on the UA. The DD shall specify the drawing size to be plotted.

3.2.2 Tooling Holes

A minimum of two tooling holes (TH) shall be identified on the UA.

3.2.3 Reference Designators

All reference designators shall be assigned per *DEC STD 056-0 Circuit Diagrams and Item Designations - General Requirements*. Items without reference designators shall be shown using the corresponding item number on the PL. The preferred item number for the 50-class circuit is *Item 1*.

Reference designators for pseudo components do not normally appear on the UA; however, *U* may be the first character of the reference designator for some mechanical or pseudo components.

If a reference designator is larger than the outline of the part it identifies, it shall be placed outside the part so that the part is clearly identifiable.

3.2.4 Spare Integrated Circuit Locations

Spare integrated circuit (IC) locations and their decoupling capacitors shall be identified with reference designators. Spare reference designators shall not appear on the Parts List (PL). A note listing all spare reference designators shall be placed on the UA. Capacitors for spare ICs, when installed at assembly, are documented as any other installed part.

3.2.5 Sockets and Heat Sinks

Sockets and heat sinks shall be shown on the UA when used. All sockets shall be represented by the reference designator *X* or an item number.

Multiple reference designators may be used when sockets or heat sinks are required. If components are pre-assembled, one reference designator shall be used.

3.2.6 Details

Details (views of sections of the module assembly) shall be used when needed for clarity. K-PL item numbers shall be used for callouts.

3.2.7 Side 2 Components

When side 2 components are used, either a detail drawing or a separate drawing, viewed from side 2, shall be supplied. The drawings must be viewed from the side on which components are mounted. These detail drawings shall be in the same scale, or larger, than the UA.

Side 2 components may also be shown from side 1 as dashed outlines with an explanatory note.

3.2.8 Rework Instructions

Manufacturing processes that require etch cuts (such as serialization) are not considered rework. The method of documenting these processes is to be determined.

3.2.8.1 Wire Adds and Component Adds/Deletes

Wire adds and component adds/deletes are documented on the UA drawing. The component overlay sheet is revised to show rework required on the component side of the module. If wires are to be added on the reverse side of the module, the hole data can be viewed from side 2 and revised to show the added wires. Wire adds may be shown from side 1 when they can be clearly indicated as side 2 wire adds.

For the rework of modules, a rework instruction sheet is added to the UA drawing. This sheet specifies all added wires and any additional rework that is required. Unless otherwise specified, channeling is not critical. Refer to *DEC STD 140-3 Documentation Requirements for Backplanes (54-, and 70-Class)* for backplane rework requirements.

3.2.8.2 Etch Cuts

Etch cuts are documented as part of the UA to illustrate rework instructions. A separate sheet showing each signal layer may be included. All layers of etch may appear on one sheet, not superimposed, if circuit size permits. It is not necessary to show negative-plotted layers. A table of information about the etch cuts and their locations is required, and shall be included on the rework instruction sheet according to the following description.

The preferred method for documenting etch cuts is to revise the PC data and increment the part revision of the PC board. The following requirements apply:

- a. A module or backplane cannot be released with nonautomated etch cuts except as approved by a waiver agreement between Engineering and the manufacturing plants building the product. This waiver agreement shall have a documented expiration date and will define when the etch cut will be incorporated into the data base and 50-class etch board.
- b. If etch cuts are required at or after a 54-class release, a release package with data and documentation supporting the part revision shall be generated. The release package shall be available to module and backplane assembly a minimum of two weeks prior to the effective (cut-in) date established during the review process.

The following information shall be provided on the rework instruction sheet, if space allows, or on a continuation of that sheet.

- The X,Y locations of all tooling holes (reference designator TH), relative to H-master 0.

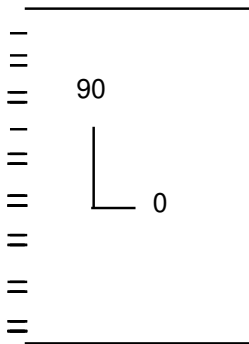
- A table of information, one for each side with etch cuts, with the following information for each etch cut:
 - Etch cut callout number
 - From-to reference designator and pin
 - X,Y locations of from-to pins (from H-master 0)
 - X,Y location of etch cut center (from H-master 0)
 - Layer where target etch is located
 - Nominal depth (in mils) from outer dielectric through target layer
 - Angle of cut (See Notes 1 and 2)
 - Obstacle components' reference designators (See Note 3)

NOTE 1

Etch cuts are made perpendicular to circuit line and typically are 0.020 inch by 0.040 inch.

NOTE 2

Cut angle is referenced as: "Fingers to the left, 0 degrees is 3 o'clock, rotation is ccw." Cut angles are 0, 45, 90, 135 degrees.



(Note 2 – Cut angle reference)



H-Master 0 (Viewed from side 1)

NOTE 3

Components within 0.150-inch radius of cut are obstacles.

For compatibility with established processes and existing software post-processing tools, the format of the etch cut information table should be as shown in Figure 5.

Figure 5: Etch Cut Information Table

Cut Locations	Loc X	Loc Y							
TH-1	2900	2600	Note: All location dimensions are from H-Master zero.						
TH-2	12937	9600							
TH-3	2900	9396							
TH-4	12937	2804							
Cut Locations	Ref_Des Pin	Pin_X	Pin_Y	Cut_X	Cut_Y	Layer	Dep	Angle	ObsCom
0-2 From To	R85-1 E76-25	12750 12800	9150 7250	9025	3925	7	12	90	None
0-3 From To	E60-3 E76-8	9000 10700	3900 7850	9035	4165	7	12	135	None
0-4 From To	E60-21 E71-13	9100 10250	3600 7050	9150	3650	7	12	45	None
0-5A From 0-5B To	E1-2 E34-37	3050 3100	5700 6600	3010 3060	5740 6560	7 7	12 12	135 45	None

4 OUTLINE DRAWING

At the request of the design engineer or manufacturing site, the locations of physical features that the design engineer deems critical shall be identified as such on the UA, if space permits. Critical features that cannot be clearly identified on the MD or UA shall be defined on a separate Outline Drawing (OD) that shall be included as part of the 50-, 54-, or 70-class release package.

5 PARTS LIST DATA BASE

PL information and format requirements are described in *DEC STD 025-0 Parts Lists*. If possible, the 50-class PWB should be the first item on the PL.

6 CIRCUIT SCHEMATICS

The module Circuit Schematic (CS) drawing is not required in the technical data package but must be released by engineering to documentation control for archiving as part of the released documentation package. Circuit schematic information and format requirements are described in DEC STD 056-0.

7 REVISIONS

The following sections discuss part revision and document revision.

7.1 PART REVISION

The 54-class part revision is the revision of the physical module described on the UA and PL and can only be changed by altering a data base, which requires a formal ECO. The 54-class part revision level is assigned and incremented per DEC STD 012-0.

7.2 DOCUMENT REVISION

A revision level assigned to the UA document is independent of the part revision and the CS document. As a result, any ECO to the UA document must indicate any corresponding changes to the part revision, CS, PL, and DD.

APPENDIX A REFERENCED DOCUMENTS

A.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00012-00	<i>DEC STD 012-0 Part Identification Standard</i>
EL-00012-01	<i>DEC STD 012-1 Documentation Identification Conventions Including Mnemonic Codes</i>
EL-00013-01	<i>DEC STD 013-1 Standard Engineering Drawing Formats and Forms - General Purpose Drawing Sizes and Formats</i>
EL-00024-01	<i>DEC STD 024-1 Top Document Requirements - DRB 126C Format</i>
EL-00025-00	<i>DEC STD 025-0 Parts Lists</i>
EL-00030-04	<i>DEC STD 030-4 Module Manufacturing Standard - Printed-Wiring Board Design Requirements</i>
EL-00056-00	<i>DEC STD 056-0 Circuit Diagrams and Item Designations - General Requirements</i>
EL-00128-00	<i>DEC STD 128-0 Security Classifications for Engineering Intellectual Property — Policy and Regulations</i>
EL-00140-00	<i>DEC STD 140-0 Documentation, Data, and Release Requirements for Printed-Wiring Boards, Modules, and Backplanes — Introduction</i>
EL-00140-01	<i>DEC STD 140-1 Documentation Requirements for Printed-Wiring Boards (50-Class)</i>
EL-00140-03	<i>DEC STD 140-3 Documentation Requirements for Backplanes (54- and 70-Class)</i>
EL-00185-00	<i>DEC STD 185-0 Documentation of Computer Media in the Engineering Documentation System</i>
EL-EN100-1A	<i>Engineering ECO Coordination Procedure</i>
EL-EN140-00	<i>Design Drawing Examples</i>
EL-ENPCB-00	<i>PC Board Engineering Handbook — Special Feature Drawings</i>

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